HOME ASSIGNMENT 1 (PART 1)
due to October 3, 23:59

Your grade cannot be higher than 100. Soft deadline is due to October 1, 23:59 (+10% to your grade), hard deadline is due to October 6, 23:59 (-30% to your grade).

Problem 1. (25 points) The only producer of the cancer prevention drug is a monopoly with the marginal costs 0.5. Monopoly faces demand from the two equal groups of consumers: low cancerophobic and high cancerophobic with the respective willingness-to-pay functions

$$v_l^{'} = \frac{1}{1+x} \text{ and } v_h^{'} = \frac{2}{1+x}.$$

The monopoly can not distinguish the consumers and offers them the prepared packages following the policy "take it or leave its".

a) Find the packages offered and how they were priced. You can refer to the lecture material to write down the FOC of the problem.

b) There were complaints from some consumers that packages were too expensive and the government decided to replace this type of discrimination by the two-part tariff. Find the entry fee and the price per unit of good in this case.

Problem 2. (25 points)
The monopolist produces a discrete good at a constant marginal cost of 4. Buyers' reserve prices are shown in the attached table "data_customers_reserve_price.xlsx".
Assuming that there is only one consumer of each type, answer the following questions:

a) What price will the monopolist set if he cannot discriminate? What profit will he get? *You can gain bonus point if you show plots for demand and profit function.*

b) What price will the monopolist set if it produces the third-degree price discrimination? What profit will he get?

c) Assuming that the monopolist can use the first-degree price discrimination, find the prices for each unit sold,your monopolist's output, and the profit.

You can solve this problem using Python, Excel or other tools that can help you [1]. With your answers you should provide your notebook or excel file.

Problem 3. (20 points)
Find an example of unusual pricing (two-part tariff, nonlinear pricing schemes, etc.) that leads to price discrimination. Provide a link to the website and/or photo. Describe it by indicating the degree of discrimination. Explain how using such pricing increases firm's profit. You can use standard examples (taxi, discounts for different groups (students, pensioners, loyalty cards, membership cards), metro tickets and other types of transport tickets, restaurant entry fees, bulk purchases, sets). *When using standard examples, the score for this problem cannot exceed 50% of the maximum points for the problem. Interesting examples may be awarded bonus points, but no more than 50% of the maximum points for the problem.*

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[1] AI is still prohibited

Problem 4. (30 points)

A monopolist with zero marginal cost ($MC = 0$) serves two distinct markets, M_1 and M_2. In each market, there are two equally sized consumer groups, A and B. The monopolist cannot directly distinguish groups.

- On market M_1:

$$Q_{A1} = 120 - P_1,$$
$$Q_{B1} = \frac{80 - P_1}{a}, \quad a > 0.$$

- On market M_2:

$$Q_{A2} = \frac{80 - P_2}{a},$$
$$Q_{B2} = 120 - P_2.$$

a) Find the price the monopolist will set without discrimination and find the profit in this case.

b) Assume that price from a) was set and for the monopolist changing the price leads to infinite cost. To increase the profit the monopolist decided to introduce a **cashback program**:

Option 1	$x\%$ cashback on their purchases in market M_1
Option 2	$y\%$ cashback on their purchases in market M_2

Each group may choose **only one option**: option 1 or option 2. Each group selects the option that maximizes their increase in consumer surplus. Groups treat cashback as a discount.

Determine for which values of the parameter a the introduction of the cashback program would increase the monopolist's profit.